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COMPLETE SPECIFICATION

An Apparatus for Widening Narrow or Constricted Internal Organs of the Body or their parts

I, (Mrs.) HELENA SADILKOVA, of Revnice No. 26, Czechoslovakia, of Czechoslovakian nationality, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to improvements in apparatus for widening narrow or constricted internal organs of the human body or their parts, such as the oesophagus, intestines (rectum), urethra, stomach, particularly where it is desired to dilate in a definite manner and to a definite degree the walls of such constricted diseased organs.

It has previously been proposed in instruments for the above purpose to combine an outer non expansible inflatable bag-like member shaped to the part to be treated and an inner expansible soft rubber bag-like member with an introducing or supporting element in such a way that a pressure fluid may be forced into said inner expansible member which expands until it reaches the extremity of the inflatable outer member and holds the latter firmly in a pressure position. The outer inflatable bag-like member may also be encased by a cover of the same material as the inner bag-like member. The introducing element consists of a firm core having a channel through which the pressure fluid for the expansible member is led and having a valve device located near its outermost extremity.

For easy and painless widening of organs of any kind and size the instrument should have the smallest possible initial size throughout its whole length, it should be adapted for placing the dilating parts always precisely at the places in the parts of the organs to be treated, and for removing all the stiff and similar parts from the inside of the instrument, after the same has been introduced into the organ, which parts after the introducing of the instrument are no longer necessary and cause unpleasant pressure on the inner walls of the organ.

All these conditions are satisfied by the apparatus according to the invention.

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which is also convenient to handle and is adapted for detaching or interchanging separate components.

The present invention consists in an apparatus for widening narrow or constricted internal organs of the human body comprising an inner expansible tube like member, an outer elastic envelope and a non-elastic intermediate member interposed between said outer and inner members, all of said members being closed at one end, whilst at the other they are provided with a fluid introducing device, through which pressure fluid may be introduced into the inner member, and is characterised in that the inner member, the interposed intermediate member, and the outer envelope, when deflated, present an external surface of the same diameter throughout the length of the apparatus, and that the means for effecting expansion of a predetermined portion or portions of the apparatus are formed by a collapsed bag like part or parts of the intermediate member, which part or parts are capable of being expanded radially to a predetermined form by pressure medium passed into the said inner member and which control the shape of the inner and outer member, which apparatus is further provided with a flexible wire stiffener secured to the pressure introducing member, and which terminates at the enclosed end of said inner member, said outer envelope having distance graduations on its outer surface to enable the apparatus to be inserted to the proper distance into the organ, to bring the dilatable portion of the apparatus exactly to the place where the constriction occurs.

The flexible wire stiffener may be removed by drawing it out of the inner member after the apparatus has been introduced into the constricted organ. The apparatus is preferably connected to a known valve arrangement and a pressure gauge.

The intermediate member may be in the form of a tube, the walls of which are of an unequal thickness, so that dilatation only occurs at the thinner places of said walls. The intermediate member may be

made of elastic material and be stiffened e.g. by textile layers in such a way that dilatation is only possible in the non-stiffened or less stiffened parts thereof.

6 Other objects of the present invention will be fully described in the detailed description and particularly pointed out in the appended claims.

One practical embodiment of the invention is shown in the accompanying drawings in which:—

Figure 1 is an axially longitudinal section through an instrument which can be expanded at one place only and which is shown in its normal condition before use.

Figure 2 shows in a reduced scale the individual members of the same instrument.

Figure 3 is an axial longitudinal section of the instrument when expanded.

Figure 4 is an axial longitudinal section through a part of the human organ with a constricted place and showing the instrument introduced therein.

25 The apparatus according to the present invention consists substantially of a stiffening and introducing member A in the form of a thin springy wire, which, at one end is secured (removably is preferred) to the pressure introducing part E and runs into the inner tube B to the closed end thereof, where the wire A terminates in a knob or ball. The purpose of this member is, while maintaining a corresponding resilience and pliability of the whole apparatus, to stiffen the remaining parts thereof and to ensure the correct and safe introduction of the apparatus into the interior of the treated organ. The second air-tight and expandible part B of the apparatus is formed of a tube with thin walls, which is closed at one end B1 and at the other end B2 is open and secured to the pressure introducing part E. The tube B serves for introducing the pressure medium into the interior of the apparatus and for the accumulation of this medium during the expansion action. The third part C is formed by an inelastic bag or bag-like tube the ends of which are arranged in the same way as those of part B. The shape of the bag C is predetermined in such manner as to control the shape and size of all expanded places of the apparatus. The form of the expanded bag in the present embodiment is illustrated in Figure 3. The outer part of the apparatus consists of a jacket D, which is resilient and capable of expanding. It may take the form of a stiffer tube of uniform width throughout with the ends arranged again in the same manner as the previously mentioned parts B or C. As long as no pres-

sure medium is applied to the apparatus the jacket D owing to its resilience, keeps the diameter of the apparatus uniform throughout its whole length, whereby the dilatable part or parts R of the inelastic bag C are folded together as is clearly apparent in Figure 1. The jacket part D has a smooth outer surface, which is provided with a scale, enabling the insertion of the apparatus to the proper distance into the organ to be treated.

The closing member E of the apparatus to which the parts A, B, C, D of the apparatus are secured, is provided with a valve device for attaching the auxiliary instruments for introducing the pressure medium into the apparatus, and with a device for sealing and discharging the pressure medium, and finally with a monometer for the regulation and checking of the pressure medium.

All said auxiliary devices may be also connected with the closing member E of the apparatus by means of a suitably long supply tube thereby securing easy manipulation occurring after insertion of the apparatus into the treated organ and enabling the said device to be controlled by the patient.

It is evident that by forcing a pressure medium through the regulating device at a suitable pressure (with a pressure gauge and the valve arrangement E) into the interior of the instrument the pressure fluid will accumulate in the fluid proof and dilatable tube B and in consequence of this the inelastic bag C will be blown up from its original folded state (see Fig. 1). The dilatation of this bag will be only possible in the predetermined widened part R (see Fig. 2) until this part reaches its full volume and actual size. The blowing up of the part R of the bag C results in a corresponding dilatation of the surrounding part of the member D, while at all other places of the instrument, where the bag C is like a narrow tube, the diameter of the instrument is not changed and remains constant.

The total length and minimum thickness of such instrument, further the number, length and mutual distance of its dilatable parts and their volume and the shape to which they can expand can always be arranged in such a way as required by the damaged organ, or as it is most advantageous for the organ and its constricted part or parts. Thus the instrument can be dilatable over its whole length and to any appropriate shape and size, or in parts of its length only between which are undilatable parts.

Further as can be seen from the present invention, the instrument can also be constructed in various modifications. The

instrument can for example be arranged in such a way that the bag-like member C may be made of an air-tight elastic material the dilatability of which is attained by the different thickness of its walls in various parts of its length. The bag-like member C may be also arranged in such a way, that it consists of a dilat-
 5 able material stiffened by another undilat-
 10 able material so that the dilatation of the desired parts may be either brought about or prevented.

The working of the present instrument is clearly shown in Fig. 4 (in reduced scale) where into the constricted organ J a suitable instrument in its normal or uninflated state is inserted and the dilat-
 15 able part R of the same is partially dilated, which according to the scale on the surface of the instrument is always precisely
 20 placed in the constricted part Jz of the organ. Further, as will be seen from this figure (showing at the same time the great importance of the arrangement of the
 25 instrument of the invention) the dilat-
 30 able part of the instrument which is in this example only partially filled with the pressure fluid, in the places of its smallest resistance i.e. on its both ends has
 35 attained already the greatest possible shape and volume and therefore by raising of its inner pressure is able further to dilate only in the places where it has not yet reached its full shape and volume, and
 40 this is precisely only against the most constricted place of the organ Jz, to which therefore all the dilating force of the instrument is transmitted and concentrated, in consequence of which the most constricted part is effectively enlarged.

By letting out the pressure fluid, the instrument returns to its original tube-like shape (see Fig. 1) which is brought
 45 about by the elasticity of the outer cover D so that the instrument can be easily withdrawn again from the organ.

The advantages of this new dilating instrument consist chiefly: in the simpli-
 50 city of the whole instrument and in its small diameter, by which it is always possible to introduce this instrument easily, safely and painlessly; in the lengthwise scale marked on the surface of this instrument which guarantees that the dilat-
 55 able part or parts of the instrument may be always precisely placed in the constricted part or parts of the organ; in the possibility of removing the single stiff
 60 member from the inside of the instrument after the same has been introduced into the organ, so that the instrument does not cause any unnecessary and inconvenient pressure on undesirable or healthy parts
 65 of the organ and especially in its curva-

tures; in the possibility of securing safe and precise graduation and control of the pressure inside the instrument, so that besides all the other advantages, the dil-
 70 ation of such organs is no longer dependent on the sensibility of the patient; in that the organ constricted in any possible manner can be again dilated either to its normal or to any other desired or neces-
 75 sary dimension, and that the widening desired can be obtained within a relatively short period and by a single instrument of this type; in that, the application of this instrument is so easy and safe,
 80 without any pain, wounds, danger of infection, hemorrhage etc. in that the patient is not dependent on any permanent expert and expensive help or any long stay in a hospital; and in that the widening obtained by this instrument is likely to be permanent because of all the above advan-
 85 tages.

Having now particularly described and ascertained the nature of my said inven-
 90 tion and in what manner the same is to be performed, I declare that what I claim is:—

1. An apparatus for widening narrow or constricted internal organs of the human body comprising an inner expansible tube
 95 like member, an outer elastic envelope and a non elastic intermediate member interposed between said outer and inner members, all of said members being closed at one end, whilst at the other they are
 100 provided with a fluid introducing device, through which pressure fluid may be introduced into the inner member, characterized in that the inner member, the interposed intermediate member, and the
 105 outer envelope, when deflated, present an external surface of the same diameter throughout the length of the apparatus, and that the means for effecting expansion of a predetermined portion or portions of
 110 the apparatus are formed by a collapsed bag like part or parts of the intermediate member, which part or parts are capable of being expanded radially to a predeter-
 115 mined form by pressure medium passed into the said inner member and which control the shape of the inner and outer member, which apparatus is further pro-
 120 vided with a flexible wire stiffener secured to the pressure introducing mem-
 125 ber, and which terminates at the enclosed end of said inner member, said outer envelope having distance graduations on its outer surface to enable the apparatus to be inserted to the proper distance into the organ, to bring the dilat-
 130 able portion of the apparatus exactly to the place where the constriction occurs.

2. An apparatus as claimed in claim 1. in which the flexible wire stiffener is re-
 130

movable by drawing it out of the inner member after the apparatus has been introduced into the constricted organ.

3. A modification of the apparatus as claimed in claims 1 or 2, in which the intermediate member is made elastic in the form of a tube, the walls of which are of an unequal thickness, so that dilatation only occurs at the thinner places of said walls.

4. A modification of the apparatus as claimed in claim 1, in which the intermediate member is made of elastic material, and is stiffened, e.g. by textile layers in such a way that dilatation is only possible in the non-stiffened or less

stiffened parts thereof.

5. An apparatus as claimed in any of the preceding claims, in which the open end of the introducing part has a suitable connecting device for a suitably long feed or supply tube, through which the pressure medium is fed, and in which the apparatus with a manometer is attached to any desired point of this tube.

6. An apparatus as particularly described with reference to the accompanying drawings.

Dated this 8th day of March, 1938.

W. P. THOMPSON & CO.
12, Church Street, Liverpool, 1.
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FIG. 1.

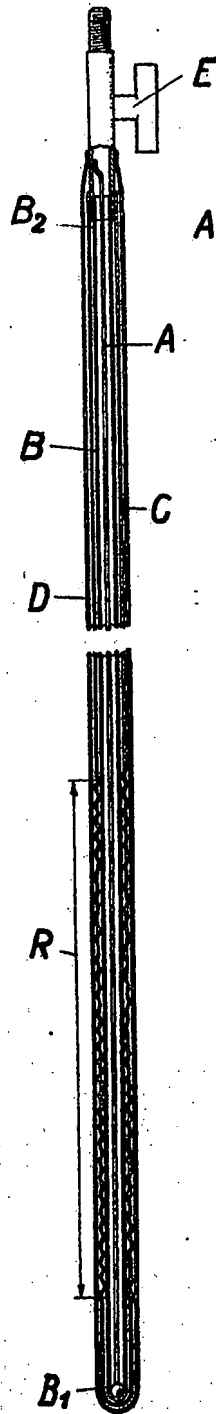


FIG. 2.

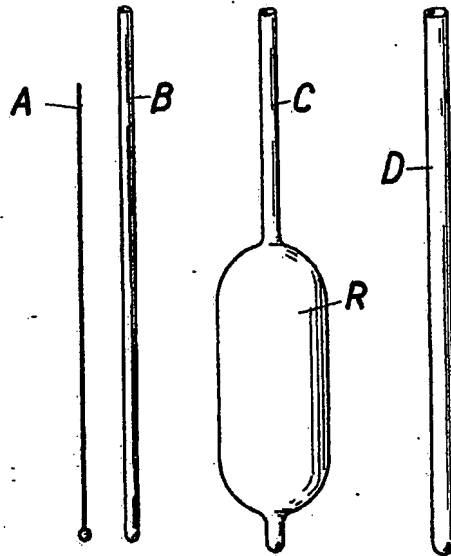


FIG. 3.

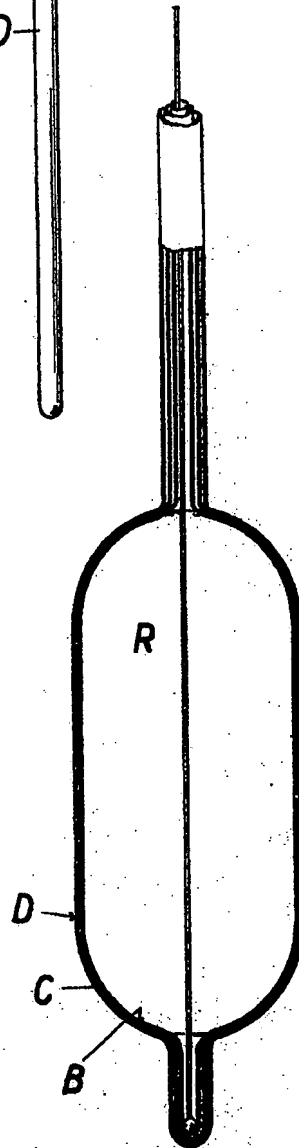
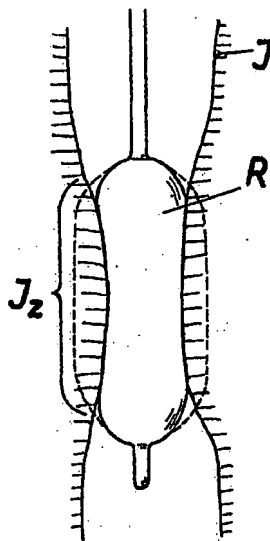


FIG. 4.



[This Drawing is a reproduction of the Original on a reduced scale.]